If you are using a printed copy of this procedure, and not the on-screen version, then you MUST make sure the dates at the bottom of the printed copy and the on-screen version match.
The on-screen version of the Collider-Accelerator Department Procedure is the Official Version.
Hard copies of all signed, official, C-A Operating Procedures are kept on file in the C-A ESHQ Training Office, Bldg. 911A.

C-A OPERATIONS PROCEDURES MANUAL

8.1.5 Ion Source Turn On

Text Pages 2 through 5

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials

Approved: ***Signature on File*** _____
Collider-Accelerator Department Chairman

Date

T. Lehn/V. LoDestro

8.1.5 Ion Source Turn On

1. Purpose

To provide instructions for Linac specialists on how to turn on the H^- ion source.

2. Responsibilities

2.1 Linac specialists are responsible for executing this procedure.

2.2 The Linac Operations Coordinator is responsible for ensuring that this procedure is implemented accurately and completely.

3. Prerequisites

3.1 The source vacuum must be below 1×10^{-6} torr.

3.2 The control system shall be operational.

3.3 Qualified and trained Linac staff.

4. Precautions

4.1 The lead panels are needed inside the 35 kV extractor power supply for shielding of x-rays.

4.2 When the source is operating, voltages up to 35 kV are present.

4.3 The source uses hydrogen and cesium during operation. Procedures must be followed during removal of the source.

5. Procedure

5.1. Turn on the following breakers (found in panel UP & 21 & 21A on the first floor Pit 1 north wall).

5.1.1 Breaker 19, PNL 21A (controls the ground level rack).

5.1.2 Breaker 10,12 PNL 21 (controls the 208, single phase for the 35 kV extractor).

5.1.3 Breaker 2, PNL 21A (controls the 208, single-phase transformer for the high voltage rack).
Breaker 8, 10 PNL 21A (source vacuum turbo controller)
Breaker 5 PNL 21A (local device controller)
Breaker 1, 3 PNL 21A (source vacuum rough pump)

5.2 Turn on the quick disconnect breaker on the side of the equipment rack inside the H.V. cage.

5.3 The low level supplies (±15 and +5) in the ground level rack and high voltage rack should now be on.

5.4 Verify that source turbopump water is running.

5.5 Check that the hydrogen bottle pressure is above 500 psi.

5.6 Check the low level supplies in the source device controller, (CDC source-1). The controller is located in the bottom of the ground level rack. All supplies can be monitored from the front panel. Make sure the device controller is communicating correctly. Observe that the cursor on the ADM-3 local terminal is scanning approximately once every three seconds and parameters can be changed. This verifies local control.

5.7 One should now switch to operating the source from the Sun workstation. Bring up the spreadsheet program, which is used to control the source. The source pages can be found under LINAC, SOURCE_1. All control of the source shall now be done via the spreadsheet. If control is not possible, contact a control systems expert.

5.8 Using spreadsheet, set the extractor power supply to zero. Set the boiler to 100 degrees C. Use a recent spreadsheet printout from the source daily log to obtain nominal timing parameters.

5.9 Switch the 75 uf cap to “in” position on the gas valve pulser (located in the high voltage rack) width limit switch in the 'OUT' position. Turn on the following supplies in the high voltage rack: discharge power supply, arc pulser, gas valve pulser, and heater power supplies. Note the LS1.source-vacuum set point on spreadsheet may have to be increased to clear the heater interlock.

5.10 Open the hydrogen bottle and raise the bottle regulator to 5 psi. Use the vacuum regulator to set the inlet pressure to 3 psi.

5.11 Raise discharge voltage and gas pressure until hydrogen mode discharge is reached. This occurs when the arc current is about 1 amp, the discharge voltage is

between 300 and 400 volts. The gas pressure may be as high as 1 x 10^{-4} torr. The heater interlock may cycle if the gas pressure is too high. Monitor all malfunctions on the malfunction panel in the ground level rack.

5.12 The discharge current will increase over a few hours, as cesium begins to enter the source. Lower the discharge power supply as required in order to keep the current in the 15-20 A range. (The current may drop off to zero if the discharge power supply is lowered too quickly). As the discharge current increases the power supply and gas pressure should also be lowered until the source is in "cesium discharge" mode. At this point, the discharge current should be 15-20 amps, the discharge voltage should be 130-160 volts, and the gas pressure should be 4-6 x 10^{-6} torr. Depending on source conditions, it may take from 2 to 8 hours to reach this stage.

5.13 Once the source pressure has been decreased to the point where it is operating in the 10^{-6} torr range, switch in the gas valve pulser supply to out position. The LSI.source-vacuum on spreadsheet will then have to be readjusted (usually increased) to bring the source back to proper operation.

5.14 The extractor supply can be turned on when the gas pressure is below 6 x 10^{-6} torr. Turn on the breaker on the front of the extractor power supply. Press the "CONTROL" button on the front panel. Press and hold the "PULSER" button for approximately 5 seconds, until the fan relay comes on. A time delay in the supply will then take about 2 minutes to clear. Check the indicator lights for the supplies in the extractor rack. The low level supplies (±15 and +5) are monitored on the front panel. Lights for the supplies in the floating grid deck (+5, ±15, +120, ±400) can be viewed from the safety window on the front panel.

5.15 Make sure the switch on the Glassman power supply is set to remote control, and the voltage is set to 0 on spreadsheet. Turn on the power supply high voltage. Then monitor the extractor voltage and loading as the voltage is raised. The voltage and loading can be monitored from the ground level rack NIM II readback monitor. Raise the voltage slowly, keeping loading below 300 milliamps. With the source in the Cs mode, the extractor will condition and eventually one will reach the 35 kV operating voltage. This conditioning could take anywhere from 5 minutes to several hours, depending on the source conditions. At 35 kV, beam current should be between 60 and 100 milliamps and loading should be below 250 milliamps.

5.16 The extractor arc rate can be monitored on the arc counter. After about 6 hours there should be less than .5% arcs.

5.17 Check the position of the beam current relative to the solenoid current pulse. Make sure that the beam is in the flattop region. This can be adjusted with the "Solenoid delay" on the source timing page.

5.18 Verify that the timing of the source pulse falls in the middle of the RFQ rf pulse.

6. Documentation

6.1 Enter all parameters in the source operating log book. A current list of important parameters is in the book. Data parameters should be logged daily.

7. Reference

7.1 H-SOURCE HANDBOOK By: R. Witkover
7.2 AGS Technical Note No. 162

8. Attachments

None